ON A SUPPOSED NEW SP CIES OF CRISTATELLA.

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I wish to announce the discovery in October last, within the waters of Harvey's Lake, Luzerne Co., Pa., of vast colonies, or, technically speaking, of aggregations of colonies of a species of *Cristatella*, exhibiting some peculiarities that seem to distinguish it from *C. mucedo* of Europe and from both the known American forms.

Harvey's Lake is a beautiful sheet of water, lying at an altitude of about 1200 feet above sea-level, amongst partially wooded hills of no great height, and taking rudely the shape of the capital letter T. Its greatest length is about two miles. The depth throughout the larger part of this extent is said to be very great, increasing rapidly a few feet from the shore. The first groups of this beautiful polyp were found upon a large inclined log or stump in deep water, within one or two feet of the surface. Here the colonies appeared as scattered vermiform masses much longer than those of *C. Idæ* of Leidy, and nearly rivaling in length those of *C. ophidioidia* of Hyatt. The longest were estimated at about six inches. Instead, however of following the sinuous lines, described by the latter author as characteristic of his species, these assumed, generally, single or continuous curves, like a parted letter O or rude C. Afterwards, in three or four instances, we found them occupying entirely novel situations.

The tops of fallen trees or large branches lying 20 or 30 feet from the shore, and spreading to a diameter of 10 or 12 feet, were covered by hundreds or thousands of these colonies, clinging to or twining around every branch and twig, yet with so slight an attachment that the motion of raising a twig above water caused them to drop off by dozens. While hanging temporarily by one end they assumed a spiral form, closely twisting upon themselves. Their gelatinous common ectocyst, nearly a line in thickness, lined the branches as far as we could reach or see. Its persistence upon those twigs brought away with us is rather remarkable, as after remaining seven months in water it is still easily recognizable. It exhibits under the microscope a plexus of fine lines like a very delicate mycelium, which indeed may now have replaced the normal structure.

The pocket lens of the collector was of course insufficient to reveal any distinctive characters in the individuals composing these colonies, and we failed in the attempt to bring any of them alive within reach of our microscopes, so that a full determination of the species has awaited the recent germination of some of the numerous statoblasts then secured. Their death in the glass jar, in which some of the colonies were carried, made it necessary several times during the past winter to change the water and wash out the corrupt matter. On these occasions the statoblasts were saved by pouring the water through a sieve. The winter months passed, and April and May came, but still they did not germinate, and I was on the point of discarding the whole as lifeless when a number of embryo colonies were fortunately discovered upon the sides of the jar.

These consisted of from one to eight polypides and exhibited this constant peculiarity. The cœnœcium, in a lateral view, might be compared in shape to a shoe; the cœnœcial cells, whether few or many, occupying solely the elevated or ankle portion; the other extremity was always prolonged into one of the many forms which fashion has dictated for our foot-covering, from the cylindrical pointed toes of some hundrds of years ago to the abbreviated stumps which still form the Chinese ideal of beauty. This feature was very conspicuous, but as I am unable to compare these young colonies with other species at a similar stage, I hesitate to assume its novelty. In the later hatchings it is far less noticeable, and in the most advanced stages which any of the healthy colonies have reached, the prolongation has ceased to be a prominent feature.

An ounce phial contained a quantity of the statoblasts which were supposed to have lost their vitality by "fouling." These were now washed thoroughly in a sieve and placed in a half-gallon jar of water. In about ten days I was rewarded by finding that they had germinated by scores, and the surface of the water was dotted with tiny groups floating with the disc side upward; the polyp heads and their beautiful plumes of tentacles depending and spreading below.

On removing a number of the statoblasts, firmly held together by their marginal hooks, for more minute examination under the microscope, I found them in all the primary stages of development; from the as yet unaltered condition in which whatever of

life may have quickened their long dormant cells, was hidden from sight by the opaque chitin of their valves, to that in which these had been pushed off to right and left and the neophite had reached forth to discover the nature and limitation of the new scene into which he had entered.

The statoblasts, as in the other species of this genus, are orbicular, reddish brown in color, relatively thick, with rounded marginal annulus and a double series of retentive hooks. The latter spring from circular membranous lines on each side, near the circumference of the chitinous body, and on one side are reflexed from the margin, while those pertaining to the other curve abruptly, partly around the annulus and then become radial in the equatorial plane; their surfaces are roughened or minutely tuberculated. Little difference is noticeable between the diameters or the degrees of convexity of the exposed sides of the statoblast; that, however, to which the longer bent hooklets are attached, is generally the larger, with a single sweeping curve, while the other has often a higher convexity at its centre. The chiton is composed of minute hexagonal cells whose outer surfaces appear to be concave[1] or depressed, but their margins are elevated here and there at the angles, into spinous papillæ, with rounded apices, more numerous near the circumference of the statoblast.

As the germination of the enclosed embryo progresses the sides or valves are forced apart, separating always at the same portion of the margin; the whole annulus remaining attached as before described, while the chitinous rim of the other is drawn out from under it, as a pill-box is separated from its lid. This is in marked contrast with the process by which the valves of *Pectinatella* are separated, as shown in the accompanying diagram.

The rounded edge of the semitransparent cœnœcium now appears and slowly protrudes itself so that it is some hours before the first polypide projects his immature tentacles. In the beginning, and sometimes for several days, the cœnœcium is nearly filled with granular particles of yolk-like matter, opaque by transmitted light and of a light waxen yellow[2] when reflected light is

[1] Prof. Allman describes the chiton cells of *C. macedo* as *convex* upon their outer surface which thus become "elegantly mammillated." A transverse section of the statoblast shows that the annulus is firmly attached to that side on which the hooks are reflexed, and spreads broadly over the rim or margin pertaining to the opposite valve.

[2] These are white in Pectinatella.

used. These are frequently collected into spherical groups, and one or more may occasionally be seen in the act of circulation or of violent revolution—the result probably of ciliary currents within the cœnœcium. These granular masses adhere to the stomach and other internal organs, obscuring their outlines and making it nearly impossible to detect the appearance of the secondary polypides; they follow, however, so soon after the first, that it is believed that several heads are considerably advanced before the separation of the valves of the statoblasts. The tentacles of the first polypide, however, are generally much better developed when it appears, than are those of the succeeding forms, indicating a nearer approach to maturity. The effect of ciliary action is quite evident in this immature condition, but the cilia themselves are minute and difficult of definition. The granular bodies and groups which obscured the body of the cœnœcium become gradually absorbed, or in some way eliminated, remaining latest in the caudal projection and finally entirely disappearing.

The whole cœnœcium then becomes beautifully transparent, disclosing not merely the structure of the individual polypides even when retracted, but the fine lines of the numerous retractor muscles may be readily traced from their connection with the stomach branchia, to their insertion in the disc or opposite portion of the endocyst. The fact that the insertion of these muscles occur in nearly parallel or radial lines upon the disc of the cœnœcium may account for the term used by writers who speak of the *cells* of the cœnœcium; but there are no cell walls, and, when entirely retracted, the stomachs of the individual polypides pass through the lines of muscular filaments and lie wherever they can find room. This "finding room" for their several personalities is often a matter of considerable difficulty to them, and of no little amusement to the observer, who, when a colony is disturbed will see the first few polypides retire with some appearance of graceful ease, but the laggards must struggle to tuck themselves into a bed where six or eight are already lying, and repeated jerks and jostles are necessary before they can finally hide themselves, as they seem to think, by drawing the transparent coverlid of the endocyst together over their heads.

The cells of the outer layer of the endocyst are in this genus larger and of greater depth than the corresponding series in *Pectinatella;* and in both genera appear to be of the same char-

acter over the whole surface of the cœnœcium, there being no such arrangement of locomotory apparatus upon the lower surface in *Cristatella* as Prof. Allman describes and figures in the case of *C. mucedo*.[1] In both genera, also, by a delicate manipulation of the light under a high power of the microscope may be detected the fine lines of transverse and longitudinal muscular tissue which form the third and fourth layers of Prof. Hyatt's series, and are visible also under the thinner cell structure of the evaginated polypide.

As generally accepted, the ectocyst, which, in *Pectinatella*, forms a solid and constantly thickening mass of gelatinoid matter, is in this genus thrown off as a fugitive film, or, more generally, a pavement layer of effete matter that supports the colonies and upon which their locomotion is effected. When the young colonies have been liberated from the floating statoblasts in my jars, they float, as has been already described, with their discs at the surface of the water, and this delicate, invisible film spreads upon the surface, uniting the neighboring colonies and forming a common basis of support from which they do not appear voluntarily to remove. In a natural situation on a stream or pond the wind or currents would probably soon waft them against some solid substance which they would afterwards colonize and inhabit. As has been said, no especial contrivance appears to exist for facilitating the locomotion of these colonies, and, while their power in this respect is, of course, unquestionable, the writer is inclined to doubt whether it is exercised voluntarily and with a purpose, or is not rather an accidental result of the frequent contractions and expansions of the retractor muscles disturbing the position of alternate portions of the disc. This seems the more plausible, as we do not find in this species any method of prehension in the colonies, but merely a gelatinous or slimy cohesion to the ectocyst.

At maturity the evagination of the polypide in the species under consideration is complete, leaving not only no "invaginated fold" but exhibiting the whole digestive system of the polyp

[1] "In the middle of the flattened under surface is an oval disc resembling the foot of a gasteropodous mollusk. On this disc, which is contractile and admits of frequent changes of shape, the colony adheres to neighboring objects or creeps about on submerged leaves and stems of aquatic plants, etc."

some distance beyond the surface of the cœnœcium. The total length of the digestive tract is rather less than that of the lophophoric arms and about equal to that of the outer rows of tentacles. These are fewer in number than in any other described species, ranging from 52–60.[1] In the great majority of the polyp heads which have been examined the number was 54; far less frequently they range upward through 56 and 58 to 60, in only one instance passing that number. On the other hand the tentacular hooks of the statoblasts are more numerous than in *C. ophidioidea*, and about the same as in the other species.

Three species of the genus have been already described, *C. mucedo*, Cuvier, in Europe, and *C. Idæ*, Leidy, and *C. ophidioidea*, Hyatt, in America. The differences existing amongst them are not considerable, and it admits of question whether all should not be merged under the prior title. In the present condition of the subject it would seem that the species now brought forward is at least as clearly differentiated from any of the former ones as they are from each other. I will therefore name it, provisionally, *Cristatella lacustris*.

EXPLANATION OF PLATE IV.

Fig 1 represents a transverse section through the centre of a statoblast of this species, *Cristatella lacustris; a, a,* the exposed chitinous surfaces of the valves; *b, b,* the reflexed; *c, c,* the bent, incurved retentive hooks; *d, d,* section of the annulus, or ring of air cells surrounding the chitinous body of the statoblast; *e, e,* the part of the rim at which the valves separate at the time of germination, as is shown on a larger scale in

Fig. 2, which represents one end of the section of a similar statoblast in the act of separation, the parts indicated by letters corresponding to those on fig. 1, with the addition of *f*, a delicate film which is being stripped from the under surface of the annulus, and *g, g,* which suggest the relative sizes and frequency of the papillæ upon the exposed surface of the valves.

Fig. 3 exhibits for comparison a corresponding section of the statoblast of *Pectinatella magnifica*, Leidy, lettered as before; *a, a,* the exposed surface of the valves; *b, b,* the single series of anchorate hooks; *d, d,* sections of the annulus, itself divided by the line *e, e,* along

[1] In *C. mucedo* and *C. Idæ* these are said to be "about 80." In *C. ophidioidea*, "not above 90."

which the separation of the valves in this genus is effected, as shown in

Fig. 4, much the larger portion of the annulus with all the hooks (which are formed by expansions of its dermal surface) remaining upon one side, and a smaller part, composed of coarser air cells upon the other. It will be noticed that in *Pectinatella* the annulus is formed of two distinct series of cylindrical cells, short upon one side of the separating line, several times this length upon the other. The corresponding cells of *Cristatella* are much more complicated, being formed about numerous transverse lines upon the internal surface. The figures have been carefully drawn by the aid of the camera lucida.

Fig. 5. Outline views of the skeleton and statoblast spicules of the sponge *Meyenia Leidyi*: *A*, the normal skeleton spicule; *B* and *C*, side and end views of the normal birotulate; *a*, *b*, *c*, the corresponding features as modified by their environment upon the iron pipes as described.